Who are you?

If you are in grade 5 or 6 and will be taking the next National Grade Six Assessment, then this packet is for you. This packet has past exam questions which have been solved with explanations to help you learn how to solve similar questions. Completing this packet will increase your chances of passing the exam with the highest possible score.

Who are we?

This packet was created by the Caribbean Education Project, a team of students and teachers from universities in the United States and the Caribbean. Our goal is to help you with your preparations for the next exam and to help you better understand each topic. We want you to achieve your best score on the exam. If you are not clear on concepts after reading the material, ask your parent or guardian for help. If they cannot help, ask another family member or a friend. If no one can help you, then ask your parents to send us a message on Facebook or WhatsApp or e-mail us.

- To reach us through Facebook, go on Facebook and search for "Shawn Shivdat." Then send me a message using Facebook Messenger.
- To reach us by WhatsApp, save this number "Shawn Shivdat, +1 404-406-9638" and message me on WhatsApp.
- To reach us by e-mail, send a message to this e-mail address: info@caribed.org.

Keep in contact

If you are using this packet to prepare, we would like to hear from you. Please keep in touch with us so we can help you with any questions you may have. We can also provide updates when future materials are posted. Send us your name and contact information through WhatsApp, Facebook Messenger, or e-mail (listed above), or send a picture of this sheet filled out through WhatsApp, Facebook Messenger, or e-mail.

Name: _____

Parent's phone number: _____

Parent's e-mail address: _____

PLEASE SHARE THIS GUIDE WITH OTHERS WHO MAY BENEFIT FROM USING IT.

How to use this guide:

1. The following pages have a total of 6 past exam questions. Try to answer these questions in the prescribed 70 minutes. If you are not able to answer a question, skip it and go on to the next question. When you are done answering all the questions, you can return to the ones you are having trouble with during your remaining time.

2. It is okay if you were not able to answer all the questions correctly on your first try. Keep practicing the questions, and you will get better. Soon, you will be able to answer all the questions in the 70 minutes. (**TIP**: Practice makes you perfect, so keep practicing.)

3. Answers to all the questions are on the pages immediately after the practice test. When you finish answering the questions, compare your answers to the answers on these pages.

4. Mark the questions which you got wrong.

5. Read our guide to solving each question. Even for questions you got correct, read the explanations we provided because you will likely learn something from them. Our explanations provide valuable information which can provide you with additional skills to solve other problems.

6. Always read the instructions for each question carefully before attempting to answer. Also, read the question itself carefully and pay attention to what the question is asking you to do before attempting to answer it.

7. We provide the answers to all the questions in the practice exams to help you. Do not look at the answers before you attempt the questions. If you look at the answers before, you will not learn a lot from this packet. So, do we have a deal? Okay, I heard you say yes.

MINISTRY OF EDUCATION

NATIONAL GRADE SIX ASSESSMENT

PRACTICE TEST

MATHEMATICS

PAPER 2

2020

Reading Time: 10 minutes
Writing Time: 60 minutes

Read these instructions carefully before you attempt to answer the questions.

1. Write your candidate number clearly on each page.
2. This paper contains six questions. You are required to answer **Question 1** and **three others.**

   Each question is worth **5** marks.

   Note: You must answer **only four** questions.

   Be sure to answer the **four** questions completely.
3. Write the answer for each question in the space provided in this booklet.
4. Answers **must** be written in complete sentences where possible.
5. Each step of your work **must** be **clearly** shown in this booklet.
6. If you have to erase, do so cleanly.
7. Look over your work when you have finished.
8. **Do not** take away any part of this booklet.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

MINISTRY OF EDUCATION

GRADE 6 – PRACTICE TEST

MATHEMATICS Paper 2 2020

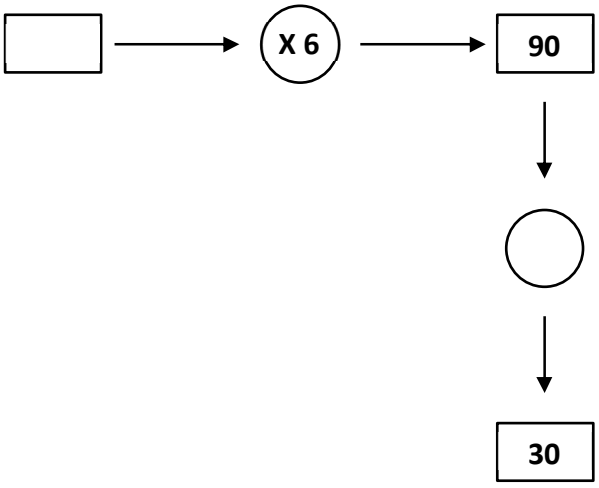
Question 1

1. (a) In a school, $\frac{3}{7}$ of the number of pupils are boys. There are 324 girls.

(i) What fraction of the total number of pupils are girls? **(1 mark)**

(ii) Calculate the total number of pupils in the class. **(2 marks)**

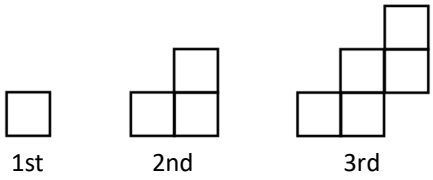
(b) Study the flow chart below, then complete the rectangle and circle.



(2 marks)

Question 2

Zena used squares to make patterns. The first three patterns are shown below. Study them carefully then answer the questions that follow.



(a) Draw the 4th pattern. **(2 marks)**

(b) Complete the table below to show the number of squares that is used to make each figure.

Figure	Number of Squares
1	1
2	3
3	5
4	
5	

(1 mark)

(c) Study the completed table then complete the rule below to determine the number of squares in the 20th shape.

[ ] x [20] – [ ]

(2 marks)

Question 3

Study the information about the iPhone below then answer the questions that follow.

AMAZON SALE

Sale Price

$180 000

plus Shipping of

12% of sale price.

GUYANA GIZMOS AND GADGETS

Cash Price

$210 000

with holiday discount

of 3% of sale price.

Amala purchased her iPhone from Amazon while Keston purchased his from Gizmos and Gadgets.

(a) How much did she pay for it? **(2 marks)**

(b) Who paid more for their phone and by how much? **(3 marks)**

Question 4

In a pack of 12 pencils, eight are red and the others are green.

(a) What is the ratio of green to red pencils? **(1 mark)**

(b) Caylandra bought 4 boxes of pencils. Calculate the number of green pencils she received. **(2 marks)**

(c) If one green pencil was replaced with one red one, how many boxes of pencils should Mark buy if he wants to have 24 green pencils? **(2 marks)**

Question 5

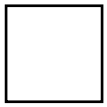
(a) (i) Evaluate $2\frac{1}{3} - 1\frac{2}{5}$ **(2 marks)**

(ii) Write your answer to part (a) as a decimal to 1 decimal place. **(1 mark)**

(b) Evaluate: $\sqrt{169} + 2^2$ **(2 marks)**

Question 6

A piece of wire 88 cm was bent to form a square as shown below.



(a) Calculate the length of one side of the square. **(1 mark)**

(b) The same piece of wire was curved to make a circle. ($\pi = \frac{22}{7}$)

(i) Calculate the radius of the circle. **(2 marks)**

(ii) Calculate the area of the circle. **(2 marks)**

END OF TEST

ANSWER EXPLANATIONS

QUESTION 1.(a)(i) ANSWER EXPLANATION

Question 1

1. (a) In a school, $\frac{3}{7}$ of the number of pupils are boys. There are 324 girls.

(i) What fraction of the total number of pupils are girls? **(1 mark)**

This problem requires you to understand **fractions**.

Fractions represent parts over wholes. The top number of a fraction is called the numerator, and it represents just a part of the whole. The bottom number of a fraction is called the denominator, and it represents the total whole. For example, the fraction we are given describes the number of boys in a class. The top part of the fraction (numerator) is 3, which means the class is 3 parts boys. The bottom part of the fraction (denominator) is 7, which means the whole entire class has a total of 7 parts.

If $\frac{3}{7}$ of the pupils are boys, this means that if the class was split up into 7 groups of equal size, 3 of those groups would be boys. The remaining groups are girls. Because there are 3 groups of boys out of the total of 7, we use subtraction to calculate how many groups are girls:

7 groups total
-3 groups of boys
4 groups remaining (these 4 groups are girls)

The fraction diagram below also illustrates how we can visualize this problem. See how there are 7 boxes total; 3 of them are boys, so the remaining 4 must be girls.

boys	boys	boys	girls	girls	girls	girls

Now that we know that 4 out of the 7 groups are girls, we can write it as a fraction, 4 out of 7:

Answer: $\frac{4}{7}$

QUESTION 1.(a)(ii) ANSWER EXPLANATION

Question 1

1. (a) In a school, $\frac{3}{7}$ of the number of pupils are boys. There are 324 girls.

(ii) Calculate the total number of pupils in the class. **(2 marks)**

There are 324 girls, so that means that the 4 groups of girls total 324 pupils. To calculate the total number of pupils, we must first calculate the number of pupils in each group. To do this, we must divide the number of girls by 4, since there are 4 groups of them.

$$324 \div 4 = 81$$

Each group contains 81 pupils. We know that there are 7 groups total, so we must multiply 81 (the number of pupils in each group) by 7 (the number of groups) to find the total number of pupils.

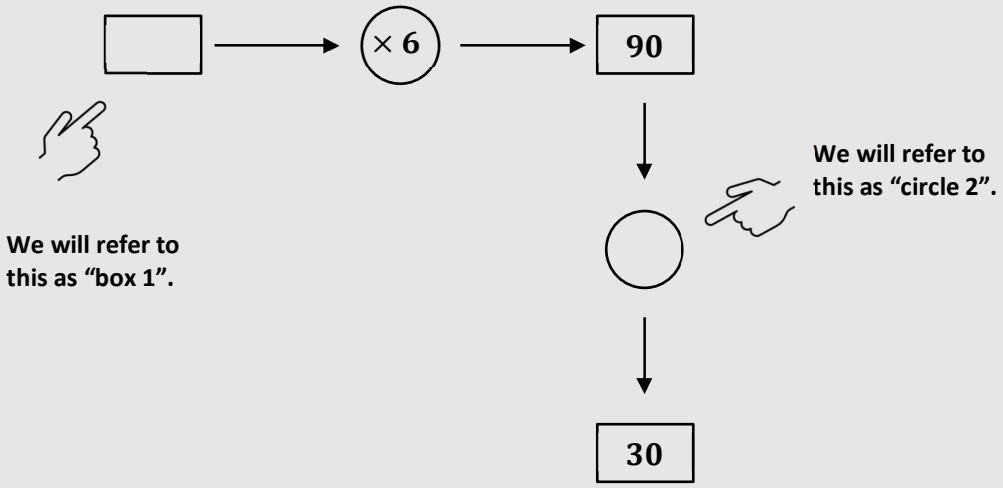
$$81 \times 7 = 567$$

Answer: 567 pupils

QUESTION 1.(b) ANSWER EXPLANATION

Question 1

1. (b) Study the flow chart below, then complete the rectangle and circle.



(2 marks)

The number in the first empty box ("box 1") is multiplied by 6 to equal 90. That means 90 divided by 6 will give us this number.

$$90 \div 6 = 15$$

Box 1 Answer: 15

To determine the value that goes in "circle 2", we see that 90 undergoes an operation to become 30. There is more than one way to express a correct answer for this. One way is to use subtraction by simply subtracting 60 from 90.

$$90 - 60 = 30$$

Another option would involve expressing the answer through division. To figure out what 90 is divided by to become 30, we divide 90 by 30.

$$90 \div 30 = 3$$

90 is divided by 3 to become 30. To understand this concept, know that multiplication and division just reverse each other. 90 divided by 3 is 30, and 30 times 3 is 90. Don't forget the division sign!

Another equally correct way to express the answer is through multiplication. Because 30 is less than 90, we need to multiply by a fraction. If you need to divide by three as we do in this problem, we can also express this as multiplying by $\frac{1}{3}$.

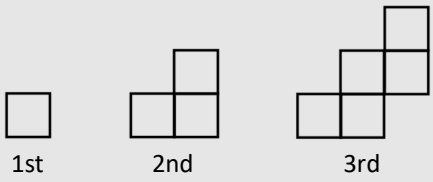
$$90 \times \frac{1}{3} = 30$$

Circle 2 Answer (all three options are correct, you can write any of them): -60 or $\div 3$ or $\times \frac{1}{3}$

QUESTION 2.(a) ANSWER EXPLANATION

Question 2

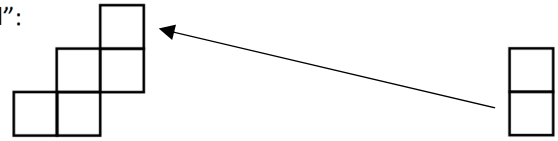
Zena used squares to make patterns. The first three patterns are shown below. Study them carefully then answer the questions that follow.



2. (a) Draw the 4th pattern. **(2 marks)**

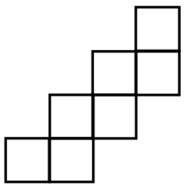
If you refer back to the diagram, you will see that a vertical stack of 2 boxes is always added to the right of the previous pattern. The bottom box of the new incoming stack aligns with the top right box of the previous pattern. The next pattern must follow the same rules: add a stack of two boxes such that the bottom box in the new stack is beside the top right stack of the previous pattern.

Previous pattern (the one that said "3rd":



Add these two vertically stacked boxes to the right of the previous pattern. Make sure that the bottom box of this incoming new addition is aligned with the top right box of the previous pattern. The arrow is showing which boxes will be touching each other.

Answer: the 4th pattern should look like this:



QUESTION 2.(b) ANSWER EXPLANATION

Question 2

2. (b) Complete the table below to show the number of squares that is used to make each figure.

Figure	Number of Squares
1	1
2	3
3	5
4	
5	

(1 mark)

The table shows a pattern: odd numbers that add 2 to each sequence. We can count the number of squares from our answer in part (a) to see that we have 7 squares: this continues our pattern of adding 2 squares to our previous figure.

To calculate the number of squares in figure 5, we must add 2 to the number of squares in figure 4.

7 squares + 2 squares = 9 squares for figure 5

Answer:

Figure	Number of Squares
1	1
2	3
3	5
4	**7**
5	**9**

QUESTION 2.(c) ANSWER EXPLANATION

Question 2

2. (c) Study the completed table then complete the rule below to determine the number of squares in the 20^{th} shape.

$$\square \times \boxed{20} - \square$$

(2 marks)

We should understand this question is telling us there must be a formula we can use that will give us the number of squares for the 20^{th} shape or any number shape in the sequence. We should be able to look at our table above and recognize a developing pattern.

The number of additional squares added to each new figure is 2, but can we recognize a repeating pattern between the figure number and the overall total number of squares?

Yes. The total number of squares is always one less than (figure $\times$ 2). In other words, you take the figure you are solving for (in this case, 20), you double it by multiplying by 2 (that would give you 40), then you finish by subtracting 1 (the final number is now 39).

Answer:

$$\boxed{\mathbf{2}} \times \boxed{20} - \boxed{\mathbf{1}}$$

QUESTION 3.(a) ANSWER EXPLANATION

Question 3

Study the information about the iPhone below then answer the questions that follow.

AMAZON SALE

Sale Price

$180 000

plus Shipping of

12% of sale price.

GUYANA GIZMOS AND GADGETS

Cash Price

$210 000

with holiday discount

of 3% of sale price.

Amala purchased her iPhone from Amazon while Keston purchased his from Gizmos and Gadgets.

3. (a) How much did she pay for it? **(2 marks)**

The phone on Amazon costs \$180 000 plus 12% shipping costs. To find the total cost that Amala paid for this phone, we must find 12% of \$180 000 and add it to the \$180 000 cost of the phone.

Remember that percentages are fractions. They mean "per cent", or "per 100". So, 12% is 12 per 100, or $\frac{12}{100}$.

To find 12% of \$180 000, we must multiply \$180 000 by $\frac{12}{100}$.

($\$180\,000 \times \frac{12}{100}$) can be simplified to ($\$180\,0\cancel{00} \times \frac{12}{\cancel{100}}$) which can now be written as $\$1800 \times 12$

$$\$1800 \times 12 = \$21\,600$$

The number \$21 600 is how much Amala paid for the 12% shipping. This amount needs to be added to the \$180 000 price of the phone to figure out the total price Amala paid for the phone.

$$\begin{array}{rr} & \$180\,000 \\ + & \$21\,600 \\ \hline & \$201\,600 \end{array}$$

Answer: Amala paid \$201 600 for her phone.

QUESTION 3.(b) ANSWER EXPLANATION

Question 3

3. (b) Who paid more for their phone and by how much? **(3 marks)**

To answer this question, we must know how much both Amala and Keston paid for their phones. We know how much Amala paid, we calculated this in part (a). To find how much Keston paid, we follow similar steps.

First, we know that Keston paid \$210 000 for the phone. But he got a 3% discount, which means that he paid 3% less than the original price. We need to calculate how much 3% of \$210 000 is and subtract it from \$210 000. In this situation, we must subtract the percentage from the phone price because it is a discount, which decreases the price.

To calculate 3% of \$210 000, we follow the same steps as we did in part (a). We know that 3% is "3 per cent", which is "3 per 100", which is the fraction $\frac{3}{100}$. We multiply \$210 000 by $\frac{3}{100}$ to find the discount.

$(\$210\,000 \times \frac{3}{100})$ can be simplified to $(\$210\,0\cancel{00} \times \frac{3}{\cancel{100}})$ which can now be written as $(\$2100 \times 3)$

$$\$2100 \times 3 = 6300$$

The number \$6300 is how much of a discount Keston gets. This is how much he can subtract from the price of the phone. The amount Keston paid is \$210 000 minus \$6300.

$$\begin{array}{rr} & \$210\,000 \\ - & \$6\,300 \\ \hline & \mathbf{\$203\,700} \end{array}$$

Now we know that Keston paid \$203 700 and Amala paid \$201 600 for their phones. We know that Keston paid more for the phone, and to find out by how much, we must subtract how much Amala paid from how much Keston paid.

	\$203 700	What Keston paid
–	\$201 600	What Amala paid
	\$2 100	**the difference in price**

Answer: Keston paid \$2100 more for the phone than Amala did.

QUESTION 4.(a) ANSWER EXPLANATION

Question 4

In a pack of 12 pencils, eight are red and the others are green.

4. (a) What is the ratio of green to red pencils? **(1 mark)**

This question requires you to have knowledge of ratios. A ratio is a relation between two amounts. In a ratio, you place two numbers side-by-side with a colon separating them, like $a : b$.

In this question, we are trying to find the ratio of green pencils to red pencils. To do this we need to find the number of green pencils and the number of red pencils. We are told there are 8 red pencils, and 12 pencils total. To find the number of green pencils, we must subtract the number of red pencils from the total number of pencils:

$$\begin{array}{rr} & 12 \text{ pencils total} \\ - & 8 \text{ red pencils} \\ \hline & 4 \text{ green pencils} \end{array}$$

After we determine the numbers of each colour of pencils, we put the numbers of pencils next to each other, separated by a colon. ***It is very important that we put the numbers in the order that the question asks.*** The question asks for the ratio of green to red pencils, so we must put the numbers in that order.

number of green pencils : number of red pencils
4 green pencils : 8 red pencils

4 : 8

Now that we have the ratio, we must simplify it. The numbers 4 and 8 are both divisible by 4. If we divide both sides of the ratio by 4, we get the simplified ratio.

4 : 8

Divide each side by 4

1 : 2

Answer: The ratio of green to red pencils is 1:2.

QUESTION 4.(b) ANSWER EXPLANATION

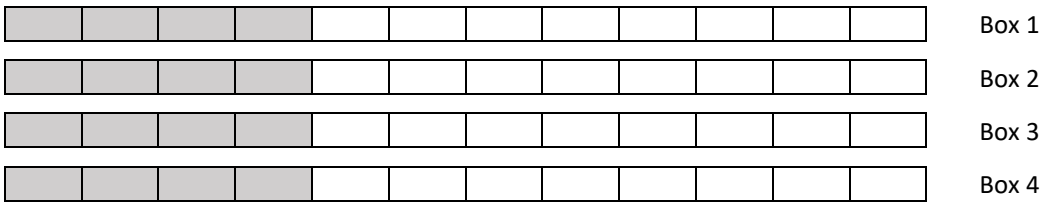
Question 4

4. (b) Caylandra bought 4 boxes of pencils. Calculate the number of green pencils she received. **(2 marks)**

We know from part (a) that each pack of 12 pencils has 4 green pencils. If Caylandra bought 4 boxes of pencils, she bought 4 sets of 4 green pencils. We can solve this mathematically by multiplying 4 by 4:

4 boxes × 4 green pencils in each box = **16 green pencils**

We can also visualize this using a picture. Each bar below represents one box of 12 pencils, and each gray square represents a green pencil.



We can count 16 shaded boxes, so once again, we see that she received 16 green pencils.

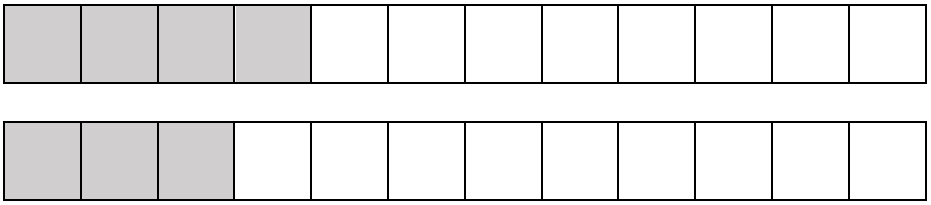
Answer: 16 green pencils

QUESTION 4.(c) ANSWER EXPLANATION

Question 4

4. (c) If one green pencil was replaced with one red one, how many boxes of pencils should Mark buy if hewants to have 24 green pencils? **(2 marks)**

We know that each box has 4 green pencils, but if one green pencil is replaced by a red one, each box will now only have 3 green pencils. See the image below for a visualization; in the image below, the shaded boxes represent green pencils and the clear boxes represent red pencils.



original box with 4 green pencils

New box after one green pencil is replaced by a red pencil

Mark wants 24 green pencils, and each box has 3 green pencils. To calculate how many boxes we need, we must divider 24 by 3. We divide 24 by 3 because Mark wants 24 green pencils, and he can only get 3 green pencils per box. Therefore, 24 divided by 3 will give us some number of boxes.

$$24 \div 3 = 8$$

Answer: 8 boxes of pencils

QUESTION 5.(a)(i) ANSWER EXPLANATION

Question 5

(a) (i) Evaluate $2\frac{1}{3} - 1\frac{2}{5}$ **(2 marks)**

In order to subtract or add fractions, we must put them in terms of a **common denominator**. Remember that a denominator is the number on the bottom of a fraction, and a numerator is the number on the top of a fraction. A common denominator is a denominator that is a multiple of all the denominators.

Because we have a mixed number (meaning, a whole number with a fraction portion), we want to convert the whole numbers so everything is expressed as fractions. We can do this by:

1. multiplying the whole number by the denominator of the fraction, then	→	For $2\frac{1}{3}$, we multiply 2 (the whole number) x 3 (the denominator) and get 6.
2. add that amount to the numerator and express the number as a fraction with the original denominator.	→	add 6 to 1 (the original numerator) to finish with $\frac{7}{3}$.

This is saying $2\frac{1}{3}$ can also be written as $\frac{7}{3}$.

Now we use the same method to convert the mixed number $1\frac{2}{5}$ into a fraction. Doing so gives us $\frac{7}{5}$.

The original question that asked us to evaluate $2\frac{1}{3} - 1\frac{2}{5}$ is now being expressed as $\frac{7}{3} - \frac{7}{5}$.

As mentioned earlier, we need to convert these different denominators into a common denominator. We typically want to work with the lowest common multiple of all the denominators. In this example, our denominators are 3 and 5, so we want to find the lowest common multiple for both 3 and 5.

A **multiple** is the number that you get when you multiply one number by another.

Multiples of 3 are numbers that you get when you multiply 3 by any number. Multiples of 3 include 3, 6, 9, 12, **15**, and so on. These correspond to (3 x 1), (3 x 2), (3 x 3), (3 x 4), (3 x 5), and so on.	Multiples of 5 are numbers that you get when you multiply 5 by any number. Multiples of 5 include 5, 10, **15**, 20, 25, and so on. These correspond to (5 x 1), (5 x 2), (5 x 3), (5 x 4), (5 x 5), and so on.

The boxes above show that **15 is the lowest common multiple for 3 and 5**. We can find the lowest common multiple for a set of values by doing what we did above and choosing the lowest number that is common for each value.

Alternatively, we can solve by using prime factorization. With this technique, we break down the original numbers in the set into their prime factors. This technique is sometimes called creating a factor tree.

However, because the numbers 3 and 5 are both prime numbers, we cannot create a factor tree and we actually just multiply them by each other to get the lowest common multiple.

Lowest common multiple: $3 \times 5 = 15$

We now know our common denominator needs to be 15, so we must put our fractions in terms of 15ths, in which 15 is on the bottom of each fraction. To put $\frac{7}{3}$ in terms of 15ths, we must multiply $\frac{7}{3}$ by $\frac{5}{5}$. This will create the same fraction (because $\frac{5}{5}$ is another way of saying 1), just now with 15 as a denominator.

$$\frac{7}{3} \times \frac{5}{5} = \frac{35}{15}$$

We do the same to convert $\frac{7}{5}$ into 15ths, except now we multiply $\frac{7}{5}$ by $\frac{3}{3}$ to get the denominator to 15.

$$\frac{7}{5} \times \frac{3}{3} = \frac{21}{15}$$

Now we can subtract our two fractions:

$$\frac{35}{15} - \frac{21}{15} = \frac{14}{15}$$

Answer: $\mathbf{\frac{14}{15}}$

QUESTION 5.(a)(ii) ANSWER EXPLANATION

Question 5

(a) (ii) Write your answer to part (a) as a decimal to 1 decimal place. **(1 mark)**

This question requires you to understand that a fraction represents division. To put a fraction in decimal form, we must divide the numerator (top number) by the denominator (bottom number). To find the fraction $\frac{14}{15}$ as a decimal, we must divide $14 \div 15$.

Because we are asked to provide an answer to 1 decimal place, we should figure out the answer to 2 decimal places so we can round the first decimal place to the next higher number if necessary. If the second decimal place is a value between 5-9, we will round the first decimal place to the next higher number; if the second decimal place is a value between 0-4, we will not round up. To calculate to 2 decimal places, we will be adding 2 zeroes after the decimal that comes after 14. We start by adding only 1 zero.

$$15\overline{)14.0}$$

Put the decimal directly above its location.

$$\begin{array}{r} . \\ 15\overline{)14.0} \end{array}$$

Now start carrying out long division. 15 goes into 140 a total of 9 times without going over. The product of $15 \times 9 = 135$, but because of the decimal, we are actually multiplying $15 \times 0.9 = 13.5$. We then subtract 13.5 from the original 14.0.

$$\begin{array}{r} 0.9 \\ 15\overline{)14.0} \\ -\ 13.5 \\ \hline 0.5 \end{array}$$

Now add the second zero to the very end of the 14.0, and drop a zero down that column to put at the end of the current sum. The zeros have been bolded, and an arrow has been added to help make this clearer.

$$\begin{array}{r} 0.9 \\ 15\overline{)14.0\mathbf{0}} \\ -\ 13.5\downarrow \\ \hline 0.5\mathbf{0} \end{array}$$

15 goes into 50 a total of 3 times without going over.

$$\begin{array}{r} 0.93 \\ 15\overline{)14.00} \\ -\ 13.5 \\ \hline 0.50 \\ -\ 0.45 \\ \hline 0.05 \end{array}$$

We now have our answer to $14 \div 15$ taken out to two decimal places. The second decimal place is a 3, so because that is less than 5, we are not going to round the first decimal place up to the next higher number. Our final answer is 0.9.

Answer: 0.9

QUESTION 5.(b) ANSWER EXPLANATION

Question 5

5. (b) Evaluate: $\sqrt{169} + 2^2$ **(2 marks)**

The first term of this equation is $\sqrt{169}$. This is pronounced "the square root of 169", and the $\sqrt{\ }$ symbol is called a **radical**. Whenever you see this radical symbol, this means that the value inside of the symbol is the product of a number multiplied by itself. We need to find this number.

For $\sqrt{169}$ we now understand that 169 is the product of a number multiplied by itself, and $\sqrt{169}$ equals that number. We know that $13 \times 13 = 169$. Since 13 multiplied by itself equals 169, then 13 is the answer to $\sqrt{169}$.

$$\sqrt{169} = 13$$

After we evaluate the radical, we must evaluate the **exponential**. Remember that **exponentials** are forms of multiplication. The larger number on the bottom is called the **base**, and the smaller number on the top is called the **exponent**. You calculate the final product of the exponential by multiplying the base by itself however many times the size of the exponent is.

Here is an example to help you understand this before we get to the rest of the problem:

The exponential 3^4 represents 3 multiplied by itself 4 times.

This would be $3 \times 3 \times 3 \times 3 = 81$

To evaluate 2^2 (the exponential we have in this problem), we would multiply 2 by itself 2 times. This would be:

$$2^2 = 2 \times 2 = \mathbf{4}$$

So, we would add 4 to our radical:

$$\sqrt{169} + 2^2 =$$

$$13 + 4 =$$

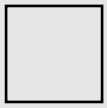
$$17$$

Answer: 17

QUESTION 6.(a) ANSWER EXPLANATION

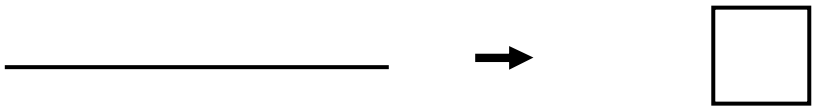
Question 6

A piece of wire 88 cm was bent to form a square as shown below.



6. (a) Calculate the length of one side of the square. **(1 mark)**

We know that the square is made up of a wire that is 88 cm long, so that means that the length of all 4 sides of the square must add to 88 cm. The total length of all sides of a square or a rectangle is called the **perimeter.**



wire length: 88 cm **perimeter: 88 cm**

We need to know that a square is defined as a quadrilateral having 4 equal sides with all four interior angles being 90°. Since all 4 sides must be equal and add up to 88 cm, we can calculate the length of each side by dividing 88 cm by 4:

88 cm ÷ 4 sides = 22 cm per side

Answer: 22 cm

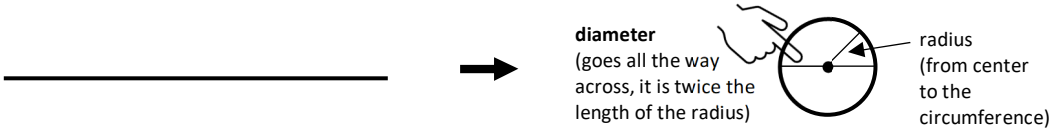
QUESTION 6.(b)(i) ANSWER EXPLANATION

Question 6

6. (b) The same piece of wire was curved to make a circle. ($\pi = \frac{22}{7}$)

(i) Calculate the radius of the circle. **(2 marks)**

Once again, we know that the entire outer portion of the circle is 88 cm long. The outer portion length of a circle is called its **circumference**. We need to find the **radius** of this circle. The radius is defined as the distance from the center of the circle to the circumference of a circle. Also important to know is the radius is half the length of the circle's **diameter**.



wire length: 88 cm **circumference: 88 cm**

It is important that you understand that the circumference of a circle is equal to π times the diameter ($C = \pi d$) or, equally correct, we can say the circumference of a circle is equal to 2 times π times the radius ($C = 2\pi r$). These are formulas you must memorize.

Now that we have this equation, we can solve it. We know the value of C, the circumference, is 88 cm, the value of π is $\frac{22}{7}$ (this was given to us in the problem), and we only need to calculate the value of r. To do this, we must get r on one side of the equation, and all other values on the other side of it. We do this by dividing both sides of the equation by 2π; this will then make r equal to C divided by 2π. See the process below.

$$C = 2\pi r$$

$$C\ (\div 2\pi) = 2\pi r\ (\div 2\pi)$$

$$\frac{C}{2\pi} = \frac{2\pi r}{2\pi}$$

$$\frac{C}{2\pi} = r$$

Now we understand that $r = \frac{C}{2\pi}$. Just like the equation $C = 2\pi r$, this will always be true for any circumference or radius of a circle. Any time you are given a circumference and you need to calculate a radius, you can use the equation $r = \frac{C}{2\pi}$. It is a good one to memorize.

The next step is to plug in the values we know and evaluate:

$$r = \frac{C}{2\pi} = \frac{88\ cm}{2(\frac{22}{7})} = \frac{88\ cm}{\frac{44}{7}}$$

Now we must understand how to **multiply and divide fractions**. To multiply two fractions, you just multiply the numerator by the numerator and multiply the denominator by the denominator. If you multiply a fraction by a whole number, like what we just did with $2 \times \frac{22}{7}$, you just multiply the numerator by the whole number. This is because technically, the number 2 can be written as $\frac{2}{1}$, and multiplying $\frac{2}{1} \times \frac{22}{7} = \frac{44}{7}$.

Dividing fractions is similar to multiplying fractions. To divide any number or fraction by a fraction, you just multiply that number or fraction by the fraction's **inverse**. An inverse of a fraction is simply switching the numerator and denominator. The numerator becomes the denominator and the denominator becomes the numerator. The inverse of $\frac{44}{7}$ is $\frac{7}{44}$.

To divide 88 by $\frac{44}{7}$, we multiply 88 by $\frac{7}{44}$:

$$r = \frac{88}{(\frac{44}{7})} \text{ can now be more easily expressed as } r = 88 \times \frac{7}{44}$$

We can make the math easier by simplifying. Because we are saying $r = \frac{88}{1} \times \frac{7}{44}$, we can also show it like this:

$$r = \frac{88}{1} \times \frac{7}{44} \text{ can also be written as } r = \frac{88 \times 7}{44}$$

Seeing the 88 in the numerator and the 44 in the denominator, we can further simply the equation to this:

$$r = \frac{88\ \text{cm} \times 7}{44} \text{ becomes } \frac{(\cancel{44}\ \text{cm})(2\ \text{cm})(7)}{(\cancel{44})}, \text{or more clearly, } \frac{(2\ \text{cm})(7)}{(1)}$$

$$\text{r} = \frac{(2\ \text{cm})(7)}{(1)} = 14\ \text{cm}$$

Answer: 14 cm

QUESTION 6.(b)(ii) ANSWER EXPLANATION

Question 6

6. (b) The same piece of wire was curved to make a circle. ($\pi = \frac{22}{7}$)

(ii) Calculate the area of the circle. **(2 marks)**

Another important equation to memorize is the equation of the area of a circle. It is the equation below, where A is the area:

$$A = \pi r^2$$

In this equation, we already have the value we want to solve for (the area) on one side of the equation while everything else is on the other side. All we have to do is plug in our values and solve. Remember that $\pi = \frac{22}{7}$ (as given in the problem).

$$A = \pi r^2$$

$$A = \frac{22}{7} \times (14\text{cm})^2 \text{ is the same as saying } \frac{22}{7} \times 14 \text{ cm} \times 14 \text{ cm}$$

$$A = \frac{(22)(14)(14)}{7} \text{cm}^2 \text{ which can now be simplified to } A = \frac{(22)(14)(\cancel{14})(\mathbf{2})}{\cancel{7} \times \mathbf{1}} \text{cm}^2$$

$$A = 22 \times 14 \times 2 = 616 \text{ cm}^2$$

Note that in our answer for area, the units are cm^2. This is because when we multiply cm by cm, we get cm^2 as our units. Area will always have units that are squared. This is another good fact to memorize.

Answer: 616 cm^2