Rational Numbers

8

μnit Test

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$$\sum = \frac{\quad}{10} = \quad \%$$

Part 1: Multiple Choice (2 marks)

Question 1:

Which of the following is equivalent to $-\frac{3}{4}$?

A. -0.75 **B.** -0.6 **C.** 0.75 **D.** 0.6

◯ A ◯ B ◯ C ◯ D

Space for question 1:

Question 2:

What is the result of $\frac{2}{3} - \frac{1}{4}$?

A. $\frac{1}{12}$ **B.** $\frac{5}{12}$ **C.** $\frac{1}{4}$ **D.** $\frac{5}{7}$

◯ **A** ◯ **B** ◯ **C** ◯ **D**

Space for question 2:

Part 2: Short Answer (4 marks)

Question 3:

Simplify the following expression: $-\frac{5}{6} + \frac{1}{3}$.

Question 4:

Convert 0.375 to a fraction in its simplest form.

Part 3: Problem Solving (4 marks)

Question 5:

A recipe calls for $\frac{3}{4}$ of a cup of sugar, but you only have $\frac{1}{2}$ a cup left. How much more sugar do you need?

Question 6:

You have $\$120$ and spend $\frac{5}{8}$ of it. How much money do you have left?

Solutions

1. (1 mark)

A. -0.75.

-Need to convert fraction to decimal, easiest to find $\frac{3}{4}$ in terms of:

$/10$ or $/100$ or $/1{,}000$ to easily convert to decimal.

$$\frac{3\times 25}{4\times 25}=\frac{75}{100}$$
$$=0.75$$

- Converting $\frac{3}{4}$ to a decimal gives 0.75, and since the fraction is negative, it's -0.75.

2. (1 mark)

B. $\frac{5}{12}$ - Find a common denominator (12) :

$$\frac{2\times 4}{3\times 4}=\frac{8}{12},$$
$$\frac{1\times 3}{4\times 3}=\frac{3}{12},$$

$$\rightarrow \frac{2}{3}-\frac{1}{4}=\frac{8}{12}-\frac{3}{12}$$
$$=\frac{8-3}{12}$$
$$=\frac{5}{12}.$$

3. (2 marks)

Common denominator is (6) :

$$
\begin{aligned}
&= -\frac{5}{6} + \frac{1 \times 2}{3 \times 2} \\
&= -\frac{5}{6} + \frac{2}{6} \\
&= \frac{-5+2}{6} \\
&= \frac{+2-5}{6} \\
&= \frac{-3}{6} \\
&= -\frac{3 \div 3}{6 \div 3} \\
&= -\frac{1}{2}.
\end{aligned}
$$

4. (2 marks)

$$
\begin{aligned}
0.375 &= \frac{375 \div 5}{1000 \div 5} \\
&= \frac{75 \div 5}{200 \div 5} \\
&= \frac{15 \div 5}{40 \div 5} \\
&= \frac{3}{8}.
\end{aligned}
$$

5. (2 marks)

$$
\begin{aligned}
&\rightarrow \frac{3}{4} - \frac{1}{2} \\
&= \frac{3}{4} - \frac{1 \times 2}{2 \times 2} \\
&= \frac{3}{4} - \frac{2}{4} \\
&= \frac{3-2}{4} \\
&= \frac{1}{4}.
\end{aligned}
$$

You need $\frac{1}{4}$ of a cup.

6. (2 marks)

$$\begin{aligned}\text{You have spent: } \frac{5}{8} \text{ of } 120 &= \frac{5}{8} \times 120 \\ &= \frac{5 \times 120}{8} \\ &= \frac{600 \div 2}{8 \div 2} \\ &= \frac{300}{4} \\ &= \frac{300 \div 2}{4 \div 2} \\ &= \frac{150}{2} \\ &= \$75\,,\end{aligned}$$

Money left: $\$120 - \$75 = \$45$. You have $\$45$ left.

OR

You have spent $\frac{5}{8}$ of your money, so you have $\frac{8}{8} - \frac{5}{8} = \frac{3}{8}$ left over.

$$\begin{aligned}\rightarrow \frac{3}{8} \text{ of } 120 &= \frac{3}{8} \times 120 \\ &= \frac{3 \times 120}{8} \\ &= \frac{360 \div 2}{8 \div 2} \\ &= \frac{180}{4} \\ &= \frac{180 \div 2}{4 \div 2} \\ &= \frac{90}{2} \\ &= \$45\,.\end{aligned}$$

You have $\$45$ left over.

$$\sum = \frac{\quad}{10} = \quad \%$$

Linear Equations and Relationships

8

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$$\sum = \frac{\quad}{10} = \quad \%$$

Part 1: Multiple Choice (2 marks)

Question 1:

Which equation represents a line with a slope of 2 and a $y-intercept$ of -3 ?

A. $y = 2x + 3$ **B.** $y = -3x + 2$ **C.** $y = 2x - 3$ **D.** $y = -2x - 3$

◯ **A** ◯ **B** ◯ **C** ◯ **D**

Space for question 1:

Question 2:

If the ratio of apples to oranges is $3:2$, how many oranges are there if there are 18 apples?

A. 9 **B.** 12 **C.** 15 **D.** 27

◯ **A** ◯ **B** ◯ **C** ◯ **D**

Space for question 2:

Part 2: Short Answer (4 marks)

Question 3:

Write the equation of the line passing through the points $(1, 3)$ **and** $(4, 9)$ **.**

Question 4:

Graph the line represented by the equation $y = -\frac{1}{2}x + 4$.

Part 3: Problem Solving (4 marks)

Question 5:

A car travels at a constant speed where it covers $150\,km$ **in** $3\,hours$ **.**
Write an equation to represent the distance (d) **traveled in terms of time** (t) **in** $hours$ **.**
How far will the car travel in $5\,hours$ **?**

Question 6:

A recipe requires 2 cups of flour for every 5 cookies.
How many cups of flour are needed for 20 cookies?
If you have 3 cups of flour, how many cookies can you bake?

Solutions

1. (1 mark)

C. $y = 2x - 3$

- This matches the given slope (2) and $y - intercept\ (-3)$.

2. (1 mark)

B. 12.

- The ratio $3:2$ means for every 3 apples, there are 2 oranges.

So, for 18 apples:

$$\rightarrow \frac{2\ oranges}{3\ \cancel{apples}} \times 18\ \cancel{apples}$$
$$= \frac{2 \times 18}{3}\ oranges$$
$$= \frac{36}{3}$$
$$= 12.$$

OR

Apples : Oranges

$$\times x \left(3:2 \rightarrow 18:? \right) \times x$$

So, $x = 6\ (18 \div 3)$

$$\times 6 \left(3:2 \rightarrow 18:12 \right) \times 6$$

3. (2 marks)

$$(1,3)\ \ (4,9)$$
$$= (x_1, y_1)(x_2, y_2)$$

First, calculate the slope (m) :

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$
$$m = \frac{9-3}{4-1}$$
$$= \frac{6}{3}$$
$$m = 2,$$

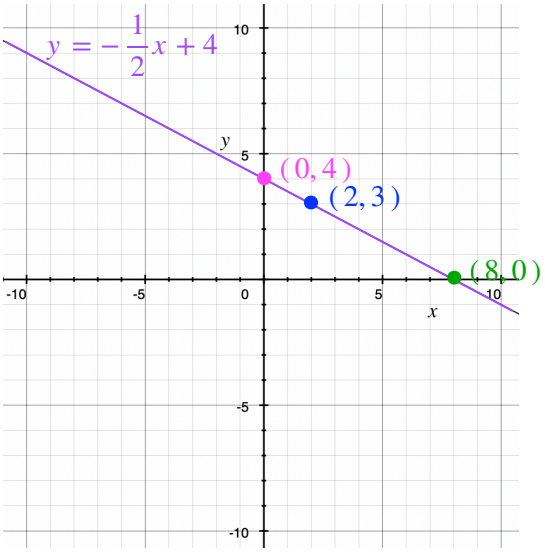
Using point-slope form with point $(1,3) = (x_1, y_1)$:

$$y - y_1 = m(x - x_1)$$
$$y - 3 = 2(x - 1)$$
$$y - 3 = 2 \cdot x + 2 \cdot -1 \quad \text{Remember, } + \times - = -$$
$$y - 3 = 2x - 2$$
$$y \cancel{-3} \cancel{+3} = 2x - 2 \ +3$$

Simplify to:

$$y = 2x + 1\,.$$

4. (2 marks)



[Description for plotting the line; start at the $y-intercept$:

Set $x = 0$ in $y = \frac{-1}{2}x + 4 \rightarrow y = 4$

So $y-intercept = (0, 4)$

and use the slope: $m = \frac{-1}{2} = \frac{\text{Rise}}{\text{Run}}$, to find a second point $(2, 3)$,

then draw a straight line through the two points]

OR

For a second point, find the $x-intercept$:

Set $y = 0$ in $y = \frac{-1}{2}x + 4$

$\rightarrow 0 = \frac{-1}{2}x + 4$

$0 - 4 = \frac{-1}{2}x + 4 - 4$

$-4 = \frac{-1}{2}x$

$-4 \times 2 = \frac{-1}{2}x \times 2$

$-8 = \frac{-2}{2}x$

$-8 = -1x$

$\frac{-8}{-1} = \frac{-1x}{-1}$

$8 = x$

$x = 8$

$\rightarrow (8, 0)$.

5. (2 marks)

$$\begin{aligned}\text{Speed} &= \frac{\text{Distance}}{\text{Time}} \\ &= \frac{150\,km}{3\,hours} \\ &= 50\,km/h\,.\end{aligned}$$

We want: Distance $=$ ... ; So move Time:

$$\begin{aligned}\text{Speed} &= \frac{\text{Distance}}{\text{Time}} \\ \text{Speed} \times \text{Time} &= \frac{\text{Distance}}{\cancel{\text{Time}}} \times \cancel{\text{Time}} \\ \text{Speed} \times \text{Time} &= \text{Distance} \\ \text{Distance} &= \text{Speed} \times \text{Time} \\ d &= 50 \times t \\ d &= 50\,t\,.\end{aligned}$$

For $5\,hours$:

$$\begin{aligned}d &= 50 \times 5 \\ &= 250\,km\,.\end{aligned}$$

6. (2 marks)

For 20 cookies:

$$\text{Cups of flour} = \frac{2\,flour}{5\,\cancel{cookies}} \times 20\,\cancel{cookies}$$
$$= \frac{2 \times 20}{5}$$
$$= \frac{40}{5}$$
$$= 8 \text{ cups.}$$

With 3 cups of flour:

$$\text{Number of cookies} = 3 \div \frac{2}{5}$$
$$= 3 \times \frac{5}{2}$$
$$= 7.5\,.$$

Since you can't make half a cookie, you can bake 7 cookies.

Remember, when dividing by a fraction:
Change the $\times$ to a $\div$, and flip the fraction being divided by. E.g. :

$$\frac{a}{b} \div \frac{d}{c}$$
$$\rightarrow \frac{a}{b} \times \frac{c}{d}$$

$$\sum = \frac{}{10} = \quad \%$$

Indices and Surds

8

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$$\sum = \frac{\quad}{10} = \quad \%$$

Part 1: Multiple Choice (2 marks)

Question 1:

What does 2^3 equal?

A. 6 **B.** 8 **C.** 9 **D.** 5

◯ **A** ◯ **B** ◯ **C** ◯ **D**

Space for question 1:

Question 2:

Which of the following is equivalent to $\sqrt{16}$?

A. 2 **B.** 4 **C.** 8 **D.** 16

◯ **A** ◯ **B** ◯ **C** ◯ **D**

Space for question 2:

Part 2: Short Answer (4 marks)

Question 3:

Simplify the expression $4^2 \times 4^3$ using index laws.

Question 4:

Express $\sqrt{50}$ in its simplest surd form.

Part 3: Problem Solving (4 marks)

Question 5:

Evaluate $\frac{3^4}{3^2}$ using index laws.

Question 6:

A square has an area of $72\,cm^2$. What is the length of one side of the square in simplest surd form?

Solutions

1. (1 mark)

B. 8

$-2^3 = 2 \times 2 \times 2$

$= 8$.

2. (1 mark)

B. 4

- The square root of 16 is 4, because 4×4,

$= 16$.

3. (2 marks)

Using the rule of multiplying exponents with the same base:

$$4^2 \times 4^3 = 4^{2+3}$$
$$= 4^5$$
$$= (2^2)^5$$
$$= 2^{2\times5}$$
$$= 2^{10}$$
$$= 1024.$$

4. (2 marks)

Factorise (50) into primes:

$$50 = 2 \times 25$$
$$50 = 2 \times 5^2$$
$$\rightarrow \sqrt{50} = \sqrt{2 \times 5^2}$$
$$= \sqrt{2} \times \sqrt{5^2}$$
$$= \sqrt{2} \times \cancel{\sqrt{5^2}}$$
$$= \sqrt{2} \times 5$$
$$= 5 \times \sqrt{2}$$
$$= 5\sqrt{2}\,.$$

OR

Factorise (50) into primes:

$$50 = 2 \times 25$$
$$50 = 2 \times 5^2$$
$$\rightarrow \sqrt{50} = \sqrt{2 \times 5^2}$$

Remember, $\sqrt{x}$ is the same as $x^{\frac{1}{2}}$

$$50^{\frac{1}{2}} = (2 \times 5^2)^{\frac{1}{2}}$$

& $(a \times b)^n = a^n \times b^n$ [reverse of: $a^n \times b^n = (a \times b)^n$]

$$= 2^{\frac{1}{2}} \times (5^2)^{\frac{1}{2}}$$
$$= 2^{\frac{1}{2}} \times 5^{2 \times \frac{1}{2}}$$
$$= 2^{\frac{1}{2}} \times 5^{\frac{2}{2}}$$
$$= 2^{\frac{1}{2}} \times 5^1$$
$$= 2^{\frac{1}{2}} \times 5$$
$$= 5 \times 2^{\frac{1}{2}}$$
$$= 5 \times \sqrt{2}$$
$$= 5\sqrt{2}\,.$$

5. (2 marks)

Using the rule for dividing exponents with the same base:

$$\frac{3^4}{3^2} = 3^{4-2}$$
$$= 3^2$$
$$= 9\,.$$

6. (2 marks)

$$\text{Since: area} = \text{side}^2 :$$

$$\text{side}^2 = \text{area}$$

$$\sqrt{\text{side}^2} = \sqrt{\text{area}}$$

$$\text{side} = \sqrt{\text{area}}$$

$$\text{side} = \sqrt{72}\,.$$

Factorise (72) :

$$72 = 8 \times 9$$

$$72 = 2^3 \times 3^2$$

$$\rightarrow \sqrt{72} = \sqrt{2^3 \times 3^2}$$ Get squared terms (n^2), so we can cancel out with a ($\sqrt{\ }$)

$$= \sqrt{2^1 \times 2^2 \times 3^2}$$

$$= \sqrt{2 \times 2^2 \times 3^2}$$

$$= \sqrt{2^2 \times 3^2 \times 2}$$

$$= \sqrt{2^2 \times 3^2} \times \sqrt{2}$$

$$= \sqrt{2^2} \times \sqrt{3^2} \times \sqrt{2}$$

$$= 2 \times 3 \times \sqrt{2}$$

$$= 6\sqrt{2}$$

So, the length of one side is:

$$= 6\sqrt{2}\ cm\,.$$

$$\sum = \frac{}{10} = \quad \%$$

General Assessment Marking Standards

Remember: When your official tests are marked, they won't be a score out of 10, they will be a grade (A,B,C,D,E) based on the following standards:

ACiQ | v9.0

Year 8 Mathematics standard elaborations

		A	B	C	D	E
		The folio of student work contains evidence of the following:				
Mathematical proficiencies	Understanding	accurate and consistent identification, representation, description and connection of mathematical concepts and relationships in complex unfamiliar, complex familiar, and simple familiar situations	accurate identification, representation, description and connection of mathematical concepts and relationships in complex familiar and simple familiar situations	identification, representation, description and connection of mathematical concepts and relationships in simple familiar situations	partial identification, representation and description of mathematical concepts and relationships in some simple familiar situations	fragmented identification, representation and description of mathematical concepts and relationships in isolated and obvious situations
	Fluency	choice, use and application of comprehensive facts, definitions, and procedures to find solutions in complex unfamiliar, complex familiar, and simple familiar situations	choice, use and application of effective facts, definitions, and procedures to find solutions in complex familiar and simple familiar situations	choice, use and application of facts, definitions, and procedures to find solutions in simple familiar situations	choice and use of partial facts, definitions, and procedures to find solutions in some simple familiar situations	choice and use of fragmented facts, definitions and procedures to find solutions in isolated and obvious situations
	Reasoning	comprehensive explanation of mathematical thinking, strategies used, and conclusions reached in complex unfamiliar, complex familiar, and simple familiar situations	detailed explanation of mathematical thinking, strategies used, and conclusions reached in complex familiar and simple familiar situations	explanation of mathematical thinking, strategies used, and conclusions reached in simple familiar situations	partial explanation of mathematical thinking, strategies used, and conclusions reached in some simple familiar situations	fragmented explanation of mathematical thinking, strategies used, and conclusions reached in isolated and obvious situations
	Problem-solving	purposeful use of problem-solving approaches to find solutions to problems.	effective use of problem-solving approaches to find solutions to problems.	use of problem-solving approaches to find solutions to problems.	partial use of problem-solving approaches to make progress towards finding solutions to problems.	fragmented use of problem-solving approaches to make progress towards finding solutions to problems.

Key	shading emphasises the qualities that discriminate between the A–E descriptors

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