Topic Test: Essential Skills

Total time allowed: 45 minutes **Total marks:** 35

1 Evaluate, $\left(1\frac{1}{4}\right)^2 + \left(\frac{1}{2}\right)^3$ giving the exact value:

A $1\frac{1}{2}$ B $1\frac{11}{16}$

C $\frac{25}{128}$ D $1\frac{5}{16}$

2 Increase \$680 by 10%.

A \$68 B \$748

C \$612 D None of these

3 Solve $x - 3 = 5$.

A 8 B 2

C $\frac{5}{3}$ D -2

4 Find the value of $\frac{1}{(8.275)^2} - (9.465)^{-2}$ correct to three significant figures:

A 0.003 B 0.003 42

C 341 D 0.003 44

5 If 55% of a quantity is \$2400, find the quantity.

A \$1320 B \$3480

C \$4363.64 D \$1080

6 $p^2 = q^2 + r^2$. Find p when $q = 7$ and $r = 24$.

A 23 B 31

C 17 D 25

7 Find the value of $\frac{(5.03)^2 \times \sqrt{2.13}}{51.4}$ correct to three decimal places.

A 0.718 B 1.392

C 1.023 D None of these

8 A diamond ring valued at \$2560 is offered for sale with 15% discount. For how much can it be bought?

A \$2176 B \$2276

C \$384 D \$2944

9 Find S correct to one decimal place when $S = 2\pi r(h + r)$ and $r = 2.1$, $h = 10.3$.

A 163.6 B 138

C 158.7 D 26.6

10 Find the value of $(3.89 \times 10^4) \div (5.8 \times 10^7)$ correct to three significant figures.

A 671 B 0.000 671

C 0.671 D 67.1

11 An electrical store buys a new TV for \$1600 and sells it for \$1800. What is the percentage profit on the selling price?

A 11.1% B 12.5%

C 8% D 9%

12 Solve $\sqrt[3]{8x} = 24$.

A 3 B 72

C 568 D 1728

13 The planet Jupiter is five-hundred and eighty-nine million kilometres from Earth. Express this distance in scientific notation.

A 589 000 000 B 589×10^6

C 5.89×10^6 D 5.89×10^8

14 If \$800 is increased by 20% and the new amount is reduced by 20%, what is the final amount?

A \$800 B \$768

C \$640 D \$750

15 Solve $\frac{x}{4} = \frac{2}{3}$.

A $\frac{1}{6}$ B 6

C $4\frac{2}{3}$ D $2\frac{2}{3}$

16 Calculate 23×15^8 and express your answer in scientific notation rounded off correctly to three significant figures. 1 mark

17 Solve: $T^3 = 4913$ 1 mark

18 Water makes up 68% of the mass of a 65 kg man. What mass of this man is water? 1 mark

19 Write 0.0003039 in scientific notation. 1 mark

20 Solve the following equation for x:

$$\sqrt{\frac{x}{3}} = 5$$

1 mark

21 Find 55% of \$820 and add it to 30% of \$150. 1 mark

22 Find correct to two decimal places:

$$\frac{\sqrt{4.3241 \times (3.932)^2}}{13.761}$$

1 mark

23 Find the value of $\frac{y^2}{x - z}$ correct to two significant figures when $y = 3.45$, $x = 5.82$, $z = 2.63$. 1 mark

24 Two months after joining an aerobics class, Matthew had reduced his weight by 15% to 57.8 kg. What was his original weight? 1 mark

25 Calculate $100^{\frac{1}{7}}$ correct to two decimal places. 1 mark

26 If $x^2 = 361$, then what does x^3 equal? 1 mark

27 A woman who earned \$79 840 a year, spent 32% of it on rent and 60% of the remainder on living expenses. How much did she have left? 1 mark

28 Find the value of $25^{-1} + 8^{\frac{1}{3}}$, leaving your answer as a mixed numeral. 1 mark

29 The distance d in km that one can see out to the horizon from a height h metres above sea level, is given by the formula $d = 5\sqrt{\frac{h}{2}}$.

Find d when $h = 4.5$ m. 1 mark

30 A plane takes on 20% more fuel than is needed to complete its scheduled flight. Find how long the flight normally takes if the plane has enough fuel to fly 7 hours and 30 minutes. 1 mark

31 Simplify: $\frac{\left(\frac{2}{3}\right)^3 - \left(\frac{5}{9}\right)^2}{\left(\frac{3}{5}\right)^0 - \left(\frac{2}{15}\right)^2}$

Leave your answer as a fraction. 1 mark

32 If $y = \frac{180x - 360}{x}$, find the value of y when $x = 5$. 1 mark

33 If a car that cost \$5000 is sold for \$6000, what is the percentage profit compared with the cost price? 1 mark

34 Evaluate $\sqrt{\frac{\pi \times (5.423)^2}{18.927}}$ correct to one decimal place. 1 mark

35 An object placed a units from a lens of focal length f units yields a clear image at a distance b units beyond the lens. The formula connecting a, f and b is

$$\frac{1}{f} = \frac{1}{a} + \frac{1}{b}.$$

Given $a = 20$ cm, $b = 30$ cm, find f. 1 mark

1 $\left(1\frac{1}{4}\right)^2 + \left(\frac{1}{2}\right)^3 = \left(\frac{5}{4}\right)^2 + \left(\frac{1}{2}\right)^3$

$= \frac{25}{16} + \frac{1}{8}$

$= \frac{27}{16}$

$= 1\frac{11}{16}$ ✓

2 10% of \$680 $= \frac{10}{100} \times \$680$

$= \$68$

$\therefore$ The increased amount $= \$680 + \$68$

$= \$748$ ✓

3 $x - 3 = 5$

$x = 5 + 3$

$x = 8$ ✓

4 $\frac{1}{(8.275)^2} - (9.465)^{-2} = 3.4413063 \times 10^{-3}$

$= 3.44 \times 10^{-3}$ [3 s.f.]

$= 0.00344$ [3 s.f.] ✓

5 55% of a quantity = \$2400

1% of a quantity $= \frac{\$2400}{55}$

100% of a quantity $= \frac{\$2400}{55} \times 100$

$= \$4363.64$ ✓

6 $p^2 = q^2 + r^2$

$p^2 = (7)^2 + (24)^2$

$p^2 = 625$

$p = \sqrt{625}$

$p = 25$ ✓

7 $\frac{(5.03)^2 \times \sqrt{2.13}}{51.4} = 0.718393\ldots$ [Cal.]

$= 0.718$ [3 d.p.] ✓

8 15% of \$2560 $= \frac{15}{100} \times \$2560$

$= \$384$

Value after discount $= \$2560 - \$384$

$= \$2176$ ✓

9 $S = 2\pi r(h + r)$

$S = 2\pi(2.1)(10.3 + 2.1)$

$S = 163.61415\ldots$ [Cal.]

$S = 163.6$ [1 d.p.] ✓

10 $(3.89 \times 10^4) \div (5.8 \times 10^7) = 6.706896552 \times 10^{-4}$

$= 6.71 \times 10^{-4}$ [3 s.f.]

$= 0.000671$ [3 s.f.] ✓

11 Cost price = \$1600,

Selling price = \$1800

Profit = \$1800 − \$1600 = \$200

Profit on selling price $= \frac{200}{1800} \times 100\%$

$= 11.1\%$ ✓

12 $\sqrt[3]{8x} = 24$

Cube both sides

$(\sqrt[3]{8x})^3 = (24)^3$

$8x = 13824$

$x = \frac{13824}{8}$

$x = 1728$ ✓

13 $589000000 = 5.89 \times 10^8$ ✓

14 Increased amount = 120% of \$800

$= \frac{120}{100} \times \$800$

$= \$960$

This amount is reduced by 20%

$\therefore$ 80% of \$960 $= \frac{80}{100} \times \$960$

$= \$768$ ✓

15 $\frac{x}{4} = \frac{2}{3}$

$x = \frac{2}{3} \times 4$

$x = 2\frac{2}{3}$ ✓

16 $23 \times 15^8 = 5.894648438 \times 10^8$

$= 5.89 \times 10^{10}$ [3 s.f.] ✓

17 $T^3 = 4913$

Take cube root of both sides

$\sqrt[3]{T^3} = \sqrt[3]{4913}$

$T = 17$ ✓

18 Mass of water = 68% of 65 kg

$= \frac{68}{100} \times 65$ kg

$= 44.2$ kg ✓

19 $0.0000309 = 3.09 \times 10^{-5}$ ✓

20 $\sqrt{\frac{x}{3}} = 5$

Square both sides

$\left(\sqrt{\frac{x}{3}}\right)^2 = (5)^2$

$\frac{x}{3} = 25$

$x = 25 \times 3$

$x = 75$ ✓

21 55% of $\$820 = \frac{55}{100} \times \$820 = \$451$

30% of $\$150 = \frac{30}{100} \times \$150 = \$45$

Total amount $= \$451 + 45 = \$496$ ✓

22 $\frac{\sqrt{4.3141 \times (3.932)^2}}{13.761} = 0.593\,483\,4576\ldots$ [Cal.]

$= 0.59$ [2 d.p.] ✓

23 $\frac{y^2}{x - z} = \frac{(3.45)^2}{5.82 - 2.63}$

$= \frac{11.9025}{3.19}$

$= 3.731\,191\ldots$ [Cal.]

$= 3.7$ [2 s.f.] ✓

24 $100\% - 15\% = 85\%$

85% of the weight $= 57.8$ kg

1% of the weight $= \frac{57.8}{85}$

100% of the weight $= \frac{57.8}{85} \times 100$

$= 68$ kg ✓

25 $100^{\frac{1}{7}} \approx 1.930\,697\,729$

$= 1.93$ [2 d.p.] ✓

26 $x^2 = 361$

Take square root of both sides

$\sqrt{x^2} = \sqrt{361}$

$x = 19$

Cube both sides

$x^3 = (19)^3$

$x^3 = 6859$ ✓

27 Amount spent on rent $= 32\%$ of $\$79\,840$

$= 32\% \times \$79\,840$

$= \$25\,548.80$

Remaining amount $= \$79\,840 - \$25\,548.80$

$= \$54\,291.20$

Amount spent on living expenses $= 60\%$ of $\$54\,291.20$

$= 60\% \times \$54\,291.20$

$= \$32\,574.72$

Amount left $= \$54\,291.20 - \$32\,574.72$

$= \$21\,716.48$ ✓

28 $25^{-1} + 8^{\frac{1}{3}} = \frac{1}{25} + 2 = 2\frac{1}{25}$ ✓

29 $d = 5 \times \sqrt{\frac{h}{2}}$

$d = 5 \times \sqrt{\frac{4.5}{2}}$

$d = 5 \times \sqrt{2.25}$

$d = 5 \times (1.5)$

$d = 7.5$ ✓

30 120% of fuel is enough for 7.5 hours

1% of fuel is enough for $\frac{7.5}{120}$ hours

100% of fuel is enough for $\frac{7.5}{120} \times 100$ hours

$= 6.25$ hours

Normal flight time $= 6$ hours 15 mins ✓

31 $\frac{\left(\frac{2}{3}\right)^3 - \left(\frac{5}{9}\right)^2}{\left(\frac{3}{5}\right)^0 - \left(\frac{2}{15}\right)^2} = \frac{\frac{8}{27} - \frac{25}{81}}{\leftarrow ① - \frac{4}{225}}$

$= \frac{\frac{-1}{81}}{\frac{221}{225}}$

$= \frac{-225}{17\,901}$

$= \frac{-25}{1989}$ ✓

32 $y = \frac{180x - 360}{x}$

$y = \frac{180 \times 5 - 360}{5}$

$y = \frac{540}{5}$

$y = 108$ ✓

33 Cost price $= \$5000$

Selling price $= \$6000$

Profit $=$ S.P. $-$ C.P.

$= \$6000 - \$5000$

$= \$1000$

Percentage profit on cost price $= \frac{1000}{5000} \times 100\%$

$= 20\%$ ✓

34 $\sqrt{\frac{\pi \times (5.423)^2}{18.927}} = \sqrt{\frac{92.390\,8753}{18.927}}$

$\approx \sqrt{4.881\,432\,625}$

$\approx 2.209\,396\,439$

$= 2.2$ [1 d.p.] ✓

35 $\frac{1}{f} = \frac{1}{a} + \frac{1}{b}$

$\frac{1}{f} = \frac{1}{20} + \frac{1}{30}$

$\frac{1}{f} = \frac{1}{12}$

Take reciprocals of both sides

$f = 12$ ✓