Name:

Exam Style Questions

Surds

Corbettmaths

Ensure you have: Pencil, pen, ruler, protractor, pair of compasses and eraser

You may use tracing paper if needed

Guidance

1. Read each question carefully before you begin answering it.
2. Don't spend too long on one question.
3. Attempt every question.
4. Check your answers seem right.
5. Always show your workings

Revision for this topic

www.corbettmaths.com/contents

Video 305
Video 306
Video 307
Video 308

1. Evaluate the following

(a) $\sqrt{3} \times \sqrt{7}$

$\sqrt{21}$

.....

(1)

(b) $\sqrt{24} \div \sqrt{6}$

$\sqrt{4} = 2$

2

.....

(2)

(c) $2\sqrt{3} \times 3\sqrt{5}$

$6\sqrt{15}$

$6\sqrt{15}$

.....

(2)

(d) $10\sqrt{8} \div 2\sqrt{2}$

$5\sqrt{4} = 5 \times 2 = 10$

10

.....

(2)

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2. Simplify $(\sqrt{3})^2$

$\sqrt{3} \times \sqrt{3} = \sqrt{9}$

3

.....

(1)

3. Work out the exact value of $(\sqrt{2})^4$

$\sqrt{2} \times \sqrt{2} \times \sqrt{2} \times \sqrt{2} = \sqrt{16}$

4

.....

(1)

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4. (a) Express $\sqrt{75}$ in its simplest form.

$\sqrt{25} \times \sqrt{3} = 5\sqrt{3}$

$5\sqrt{3}$

.....

(1)

(b) Express $\sqrt{32}$ in its simplest form.

$\sqrt{16} \times \sqrt{2} = 4\sqrt{2}$

$4\sqrt{2}$

.....

(1)

(c) Express $\sqrt{8}$ in its simplest form.

$\sqrt{4} \times \sqrt{2} = 2\sqrt{2}$

$2\sqrt{2}$

.....

(1)

(d) Express $\sqrt{200}$ in its simplest form.

$\sqrt{100} \times \sqrt{2} = 10\sqrt{2}$

$10\sqrt{2}$

.....

(1)

5. Simplify fully

(a) $\sqrt{50} + \sqrt{32}$

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

$\sqrt{32} = \sqrt{16} \times \sqrt{2} = 4\sqrt{2}$

$5\sqrt{2} + 4\sqrt{2}$

$9\sqrt{2}$

(2)

(b) $\sqrt{80} + \sqrt{20}$

$\sqrt{80} = \sqrt{16} \times \sqrt{5} = 4\sqrt{5}$

$\sqrt{20} = \sqrt{4} \times \sqrt{5} = 2\sqrt{5}$

$4\sqrt{5} + 2\sqrt{5} = 6\sqrt{5}$

$6\sqrt{5}$

(2)

(c) $\sqrt{200} - \sqrt{72}$

$\sqrt{200} = \sqrt{100} \times \sqrt{2} = 10\sqrt{2}$

$\sqrt{72} = \sqrt{36} \times \sqrt{2} = 6\sqrt{2}$

$10\sqrt{2} - 6\sqrt{2}$

$4\sqrt{2}$

(2)

(d) $3\sqrt{12} + \sqrt{75}$

$3\sqrt{12} = 3(\sqrt{4} \times \sqrt{3}) = 3(2 \times \sqrt{3}) = 6\sqrt{3}$

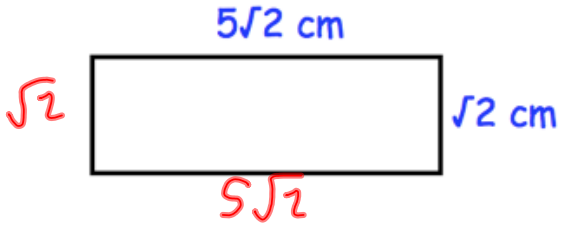
$\sqrt{75} = \sqrt{25} \times \sqrt{3} = 5\sqrt{3}$

$6\sqrt{3} + 5\sqrt{3}$

$11\sqrt{3}$

(3)

6. Shown below is a rectangle.



(a) Find the perimeter of the rectangle.

12√2 cm

(2)

(b) Find the area of the rectangle.

$5\sqrt{2} \times \sqrt{2}$

$= 5\sqrt{4} = 5 \times 2$

10 cm²

(2)

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7. Write each of these in the form a√3, where a is an integer.

(a) √6 x √8

$\sqrt{48} = \sqrt{16} \times \sqrt{3}$

$4\sqrt{3}$

(2)

(b) √27 + √75

$\sqrt{27} = \sqrt{9} \times \sqrt{3} = 3\sqrt{3}$

$\sqrt{75} = \sqrt{25} \times \sqrt{3} = 5\sqrt{3}$

$8\sqrt{3}$

(2)

8. Rationalise the denominator of

$\frac{15}{\sqrt{5}}$ $\times\sqrt{5}$ $\times\sqrt{5}$

$\frac{15\sqrt{5}}{5} = 3\sqrt{5}$

$3\sqrt{5}$

(2)

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9. Simplify fully $\sqrt{600} + \sqrt{24}$

$\sqrt{600} = \sqrt{100} \times \sqrt{6} = 10\sqrt{6}$

$\sqrt{24} = \sqrt{4} \times \sqrt{6} = 2\sqrt{6}$

$12\sqrt{6}$

(2)

10. (a) Rationalise the denominator of

$\frac{12}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$

$\frac{12\sqrt{3}}{3} = 4\sqrt{3}$

$4\sqrt{3}$

(2)

(b) Evaluate $\sqrt{2} \times \sqrt{32}$

$\sqrt{64}$

8

(2)

(c) Expand and simplify $(\sqrt{3} + \sqrt{5})^2$

$(\sqrt{3}+\sqrt{5})(\sqrt{3}+\sqrt{5})$

$\sqrt{9} + \sqrt{15} + \sqrt{15} + \sqrt{25}$

$3 + \sqrt{15} + \sqrt{15} + 5$

$8 + 2\sqrt{15}$

(2)

(d) Evaluate $(5 + \sqrt{2})(5 - \sqrt{2})$

$25 - 5\sqrt{2} + 5\sqrt{2} - \sqrt{4}$

$25 - \sqrt{4}$

$25 - 2 = 23$

23

(2)

11. (a) Simplify fully $\sqrt{3}(\sqrt{27} - \sqrt{3})$

$\sqrt{81} - \sqrt{9}$

$9 - 3 = 6$

6

.....

(2)

(b) Given that $a = \sqrt{2}$ $b = \sqrt{15}$ $c = \sqrt{30}$

work out the value of

$\frac{b}{ac}$ $\frac{\sqrt{15}}{\sqrt{2} \times \sqrt{30}} = \frac{\sqrt{15}}{\sqrt{60}}$

write your answer in its simplest form

$\frac{\sqrt{15}}{\sqrt{60}} = \frac{\sqrt{1}}{\sqrt{4}} = \frac{1}{2}$

.....

(3)

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12. Rationalise the denominator of

$\frac{12}{7\sqrt{3}}$ $\times\sqrt{3}$ $\times\sqrt{3}$ $\frac{12\sqrt{3}}{7\sqrt{9}} = \frac{12\sqrt{3}}{7 \times 3} = \frac{12\sqrt{3}}{21}$

$\frac{4\sqrt{3}}{7}$

.....

(2)

13. Given that $a = \sqrt{3}$ and $b = \sqrt{48}$

(a) find the value of a^2

3

.....

(1)

(b) show that $(a + b)^2 = 75$

$(\sqrt{3}+\sqrt{48})(\sqrt{3}+\sqrt{48})$

$= 3+\sqrt{144}+\sqrt{144}+48$

$= 3+12+12+48$

75

.....

(3)

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14. Expand and simplify $(3 + \sqrt{8})(4 + \sqrt{2})$

Give your answer in the form $a + b\sqrt{2}$ where a and b are integers.

$12+3\sqrt{2}+4\sqrt{8}+\sqrt{16}$

$12+3\sqrt{2}+4(2\sqrt{2})+4$

$12+3\sqrt{2}+8\sqrt{2}+4$

$16+11\sqrt{2}$

.....

(4)

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15. Simplify $5\sqrt{8} + \sqrt{18}$

$5(2\sqrt{2})+3\sqrt{2}$

$10\sqrt{2}+3\sqrt{2}$

$13\sqrt{2}$

.....

(2)

16. Rationalise the denominator of

$\frac{8}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$

$\frac{8\sqrt{2}}{2} =$

$4\sqrt{2}$

.....

(2)

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17. Expand and simplify $(\sqrt{7} - \sqrt{3})^2$

$(\sqrt{7}-\sqrt{3})(\sqrt{7}-\sqrt{3})$

$7 - \sqrt{21} - \sqrt{21} + 3$

$10 - \sqrt{21}$

.....

(2)

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18. Write $\sqrt{11} + \sqrt{99}$ in the form $a\sqrt{b}$ where a and b are integers.

$\sqrt{11} + 3\sqrt{11}$

$4\sqrt{11}$

.....

(2)

19. Expand $(8 - \sqrt{3})^2$ giving your answer in form $a + b\sqrt{3}$

$(8-\sqrt{3})(8-\sqrt{3})$

$64 - 8\sqrt{3} - 8\sqrt{3} + 3$

$67 - 16\sqrt{3}$

.....

(2)

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20. Show that $(\sqrt{2} + 3\sqrt{8})^2 = 98$

$(\sqrt{2} + 3\sqrt{8})(\sqrt{2} + 3\sqrt{8})$

$2 + 3\sqrt{16} + 3\sqrt{16} + 9 \times 8$

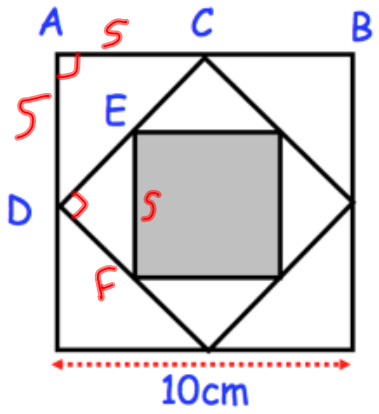
$2 + (3 \times 4) + (3 \times 4) + 72$

$2 + 12 + 12 + 72 =$ 98

.....

(3)

21. The midpoints of the sides of a square of side 10cm are joined to form another square. This process is then repeated to create the shaded square.



Find the area of the shaded square.

$CD^2 = AC^2 + AD^2$

$CD^2 = 5^2 + 5^2$

$CD^2 = 50$

$CD = \sqrt{50}$

$DE = CD \div 2 = \frac{\sqrt{50}}{2}$

$EF^2 = DE^2 + DF^2$

$EF^2 = \left(\frac{\sqrt{50}}{2}\right)^2 + \left(\frac{\sqrt{50}}{2}\right)^2$

$EF^2 = \frac{50}{4} + \frac{50}{4} = \frac{100}{4} = 25$

$EF = 5$

$5 \times 5 = 25$

25 .....cm²

(4)

22. Given that

$$\frac{10 - \sqrt{32}}{\sqrt{2}} = a + b\sqrt{2}$$

where a and b are integer.

Find the values of a and b.

$$\frac{\sqrt{2}(10 - \sqrt{32})}{2} = \frac{10\sqrt{2} - \sqrt{64}}{2}$$

$$\frac{10\sqrt{2} - 8}{2} = 5\sqrt{2} - 4$$

a = -4

b = 5

(4)

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23. A shed has dimensions, in metres, of

height = $\sqrt{5}$, width = $\sqrt{6}$ and length = $\frac{9}{\sqrt{2}}$

Find the volume of the shed.
Give your answer in the form $a\sqrt{15}$, where a is an integer.

$$\sqrt{5} \times \sqrt{6} \times \frac{9}{\sqrt{2}}$$

$$\sqrt{30} \times \frac{9}{\sqrt{2}} = \frac{9\sqrt{30}}{\sqrt{2}} = 9\sqrt{15}$$

$9\sqrt{15}$ m^3

(3)